INTENSIVE COLLEGE COUNSELING AND THE ENROLLMENT AND PERSISTENCE OF LOW-INCOME STUDENTS

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Abstract

Though counseling is one commonly pursued intervention to improve college enrollment and completion for disadvantaged students, there is relatively little causal evidence on its efficacy. We use a regression discontinuity design to study the impact of intensive college counseling provided by a Massachusetts program to college-seeking, low-income students that admits applicants partly on the basis of a minimum grade point average requirement. Counseling shifts enrollment toward four-year colleges that are less expensive and have higher graduation rates than alternatives students would otherwise choose. Counseling also improves persistence through at least the second year of college, suggesting a potential to increase the degree completion rates of disadvantaged students.

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1. INTRODUCTION

Although college enrollment among low-income students has increased steadily over the last decade, the share of students from the lowest-income families that enroll in college continues to lag considerably behind college entry rates among the highest-income students (Baum, Ma, and Payea 2013). Furthermore, gaps in college completion by family income have only widened over time; among students who graduated high school in the late 1990s and early 2000s, 54 percent of students from the highest-income quartile had earned a bachelor's degree by age 25 compared with only 9 percent of students from the lowest-income quartile (Bailey and Dynarski 2011).

Despite substantial economic returns associated with completing college—especially for low-income students—there are various financial and informational barriers that may prevent economically disadvantaged students from accessing higher education at all, or from selecting institutions that are well matched to their abilities and circumstances. Lower-income students and their families tend to overstate the net costs of going to college, may have difficulty identifying the full set of colleges and universities to which they would be academically admissible, and may not understand the variation in college quality or affordability among different higher education institutions (Horn, Chen, and Chapman 2003; Avery and Kane 2004; Grodsky and Jones 2007; Hoxby and Avery 2013; Hoxby and Turner 2013). Students may also be uncertain about where they can access professional assistance with college or financial aid applications, and as a result may forego completing these applications entirely or may miss out on key deadlines (Bettinger et al. 2012; Hoxby and Turner 2013; Castleman and Page 2016).

Policy interventions to ameliorate socioeconomic inequalities in college entry and success have historically focused on increasing college *access* among students from economically disadvantaged backgrounds. The earnings premia associated with college primarily accrue, however, not based on whether students have completed some college but rather based on whether they earn a degree (Baum, Ma, and Payea 2013). This relationship between earnings and degree attainment, combined with growing concerns about loan debt that students accumulate in order to pursue higher education, has prompted heightened focus on whether students are attending institutions where they are well positioned for success. Recent research suggests that students who attend higher-quality institutions, as measured by institutional characteristics like six-year graduation rates, are more likely to persist in college and earn a degree (Hoxby and Turner 2013; Cohodes and Goodman 2014; Goodman, Hurwitz, and Smith 2017). At the same time, as many as half of low-income students neither apply to nor attend the quality of institution at which they appear admissible based on their academic credentials (Bowen, Chingos, and McPherson 2009; Hoxby and Avery 2013; Smith, Pender, and Howell 2013).

A more recent set of policy interventions has emerged to: (1) guide students to choose colleges where they have a good probability of earning a degree without incurring excessive debt, and (2) provide ongoing support to students once they have matriculated in college. One example of these policy interventions is to provide high-achieving, low-income students with customized information about their postsecondary options, which can result in students attending and persisting at higher-quality institutions (Hoxby and Turner 2013). Although this type of low-touch, informational

intervention has received considerable attention and interest, many communities rely on more intensive college advising models to improve both overall college access and choice among low-income students. These interventions are typically run by community-based nonprofit organizations, and provide individualized guidance to students throughout the college search, application, and financial aid processes.

Though community-based college advising programs have existed for decades, there is relatively little causal evidence documenting their impact on important student outcomes, including the quality and affordability of the institution at which students enroll and whether they persist and succeed in college. Existing research evidence is mixed. Recent pilot experiments suggest that intensive college advising can substantially increase enrollment at four-year institutions, though these studies have not followed students longitudinally to investigate whether the advising contributes to improved persistence and success (Avery 2010, 2013). Similarly, providing students with intensive peer mentoring during the second half of their senior year can substantially increase the share of students who enroll and persist in college (Carrell and Sacerdote 2013). An experimental evaluation of the federally funded Upward Bound program failed, however, to find any improvement in students' postsecondary outcomes (Seftor, Mamun, and Schirm 2009). Hurwitz and Howell (2014) exploit maximum student–counselor ratios to generate regression discontinuity estimates showing that additional high school counselors increase four-year college enrollment rates, though their estimates are somewhat imprecise.[1]

Additional rigorous evidence on the efficacy of intensive college advising programs would be of considerable value to researchers and policy makers. Although these programs cost much more than low-cost informational interventions, they may be more effective at improving postsecondary pathways for a more academically mainstream population of students. And to the extent they contribute to meaningful increases in degree attainment, the long-term benefits may justify sizeable upfront expenditures. To address this gap in the literature, we evaluate the impact of an intensive college advising program—called Bottom Line—on low-income students' college enrollment and persistence. Bottom Line, which operates programs in Boston and Worcester, Massachusetts, provides advising throughout the senior year of high school. Its advisors meet individually with students to develop lists of well-matched colleges and universities to which they can apply. Advisors help students complete their college and financial aid applications and, once students have received acceptances, assist students in choosing which college to attend.

A somewhat unique feature of the Bottom Line model is its emphasis on encouraging students to apply to and attend a set of twenty or so target colleges and universities. Bottom Line has identified these schools as institutions where students have a similar probability of graduating as at other commonly attended institutions, while facing lower average net costs without incurring excessive loan debt. For instance, one of the target institutions, Framingham State University, a public four-year university, has a 51 percent six-year graduation rate and an average net price of $17,552. For students who

1. School counselors may also have impacts prior to high school. Carrell and Hoekstra (2014), for example, find that the random addition of a graduate student counselor intern in elementary schools improves boys' test scores and behavior. Reback (2010) finds that additional elementary school counselors improve behavior but not test scores.

enroll at one of the target institutions, Bottom Line continues to provide individualized, campus-based support for up to six years following high school.

Bottom Line also discourages students from attending institutions where prior cohorts of students have either struggled to graduate or have accumulated substantial debt. An example of a discouraged institution is Curry College, a private four-year university where the graduation rate is 44 percent and the average net price is $30,561. Bottom Line thus strives to affect not only whether students enroll in college but where they enroll as well.

We exploit the fact that Bottom Line admits applicants partly on the basis of a minimum grade point average (GPA) requirement, a requirement not extensively publicized by the organization and which empirical evidence suggests students are not aware of. We implement a regression discontinuity design comparing students just above and below this threshold and find that counseling successfully shifts enrollment toward the four-year colleges encouraged by Bottom Line, which are largely public and substantially less expensive than alternatives students would otherwise choose. We also find evidence that counseling improves persistence through at least the second year of college, suggesting potential to increase the degree completion rates of disadvantaged students.

We organize the remainder of the paper as follows. In section 2, we discuss Bottom Line and its college counseling programs. In section 3, we describe our data and empirical strategy. In section 4, we present our results. In section 5, we conclude with a discussion of these findings and their implications for policy, practice, and further research.

2. BOTTOM LINE

Bottom Line was founded in Boston, Massachusetts, in 1997 and provides support to students who attend a variety of public and charter high schools in Boston and Worcester.[2] It offers two types of services: an Access Program that helps students enroll in college and a Success Program that helps students persist in commonly attended regional colleges. Students apply to the Access Program during the second half of their junior year of high school. Bottom Line works extensively with schools and community-based organizations in each city to promote the program and to encourage students to apply. Bottom Line collects a substantial amount of self-reported academic and demographic information from students, but admissions decisions to the Access program are based primarily on students' family income, first-generation college-going status, and cumulative GPA as of junior year in high school.

Once students complete the initial Bottom Line application, Bottom Line staff review the applications and determine whether, based on students' self-reported information, they appear to meet the family income and GPA requirements for admission to the program. Bottom Line targets students who make less than 200 percent of the federal poverty guidelines and whose high school GPA is 2.5 or higher. The latter requirement is to ensure that students are academically ready for college-level work. Students who appear to meet these thresholds are invited to bring copies of their parents' tax returns and their high school transcripts to verify their income and GPA. Upon confirmation of eligibility, Bottom Line officially admits students to the program.

2. Bottom Line has also begun more recent operations in New York City and Chicago.

Bottom Line starts working with students admitted to the Access program between the end of their junior year and the start of their senior year of high school. Each student is assigned to a counselor employed full-time by Bottom Line and, by senior year, meets with that counselor for an hour every two to three weeks during the application season. These meetings take place outside of school at the Bottom Line offices. Bottom Line advisors do not directly collaborate with students' school counselors, but do interact with students' parents as needed—for example, around financial aid forms. The counselors help seniors navigate the college application process by assisting them with creating lists of potential schools, writing essays, completing applications, applying for financial aid, searching for scholarships, resolving any problems that arise and, finally, selecting a suitable college.

What differentiates Bottom Line from school-based college counseling and from other programs in the community is its intensive focus on college choice and affordability—helping students find affordable colleges where they can succeed, in part by encouraging students to consider colleges and universities where prior cohorts have been successful. Much of Bottom Line advisors' time with students during the fall semester is spent working on college list formation. Advisors actively work with students to identify schools where they appear to be a good academic match based on their high school record and where they are likely to face manageable costs net of financial aid they receive. In the spring semester Bottom Line advisors help students complete financial aid applications and actively work with students to interpret financial aid award letters they receive from colleges to which they have been admitted, with the goal of helping students make informed financial choices about where they choose to enroll.

At the end of senior year, students in the Access program are invited to continue into the Success program if they plan to attend one of the roughly twenty colleges and universities where Bottom Line provides ongoing campus-based support to students. Within a given cohort of Access seniors, approximately 70 percent choose to attend one of these "encouraged" colleges, and only a small percentage of these choose not to continue in the Success program. Bottom Line selected these institutions as ones to encourage student enrollment based on where early participants in the Access program had the greatest track records of persistence and success without incurring substantial debt. As mentioned above, Bottom Line also discourages students from attending institutions where prior cohorts of students have struggled to succeed or where students had to assume substantial debt to fund the cost of attendance. Appendix table A.1 shows the list of encouraged and discouraged colleges. Data from the Integrated Postsecondary Education Data System (IPEDS) suggests that the average encouraged college's six-year graduation rate is 66 percent, compared with 40 percent for the discouraged colleges. Encouraged colleges are also substantially less expensive, charging an average tuition of $23,500 annually compared with $29,800 for the discouraged colleges. Encouraged colleges are split between public and private institutions and are relatively large, whereas discouraged colleges are all private and relatively small.

Through the Success Program, Bottom Line first provides transitional programming each summer for rising college students, discussing how to read a college syllabus or what to expect from life on a college campus, among other topics. College students are then advised and mentored on campus for up to six years by Bottom Line

counselors to ensure that students have the support they need to earn a degree. First-year students meet with Bottom Line counselors approximately three to four times per semester, and older students meet with a counselor twice a semester on average. The support focuses on academic, financial, career, and personal challenges.

3. DATA AND EMPIRICAL STRATEGY

Data

Data for this analysis come from Bottom Line, from the Massachusetts Department of Elementary and Secondary Education (DESE), and from IPEDS. Bottom Line's data include all information it receives from students during their application process, as well as data it generates during its selection process. We know each applicant's full name, high school, and high school class, and a small number of other self-reported characteristics, including GPA and family size.[3] Using each applicant's name, high school, and class, we merge Bottom Line's data to DESE's administrative data on all Massachusetts public school students. Our match rate exceeds 93 percent. Of the 7 percent of students who are unmatched, half are enrolled in private schools or are missing school information entirely. The other half either have common names, which prevents us from uniquely identifying them in DESE's data, or have names that do not match DESE's records, either due to misspelling, use of nicknames or other use of non-legal names. We verify both that unmatched applicants look demographically quite similar to the sample as a whole and that match rates are unrelated to treatment status. We are thus unconcerned that our subsequent results are confounded by the small number of unmatched applicants.

DESE's data contain demographic characteristics such as gender, race, and low-income status, as well as indicators for various educational designations, such as English as a second language, limited English proficiency, and special and vocational education status. DESE has also merged data on its high school students with National Student Clearinghouse (NSC) data that tracks college enrollment throughout the United States. Research by Dynarski, Hemelt, and Hyman (2015) suggests that NSC coverage rates are around 95 percent for recent Massachusetts cohorts, implying that nearly all college enrollment of our applicants should be captured by these data. In particular, other than colleges that specialize in theology, art, music, or law, every public and private four-year college in Massachusetts that is listed in IPEDS also appears in the NSC during the time period we are studying.

The NSC identifies which, if any, college a student is enrolled in at any moment in time. It also identifies whether colleges are four-year or two-year, and public or private. We supplement this with data from IPEDS that measure for each college institutional characteristics such as six-year graduation rates and average net prices paid by enrolled students. We limit the analysis sample to students with valid self-reported GPAs

3. Bottom Line also attempts to verify some of the self-reported characteristics, including income and GPA. The chance that Bottom Line does this for a given student is related to their initial self-reports and is thus endogenous to the selection process itself. As such, we focus on the versions reported initially by all students on their applications. Though our main specifications include all students, our central results are not affected by excluding the 300 or so students who are ineligible due to income, first-generation status, or other reasons not related to GPA.

Table 1. Summary Statistics

	(1) 2010–14	(2) 2010–12
Panel A: Demographics		
Low income	0.80	0.78
Black	0.41	0.40
Hispanic	0.28	0.30
Asian	0.21	0.19
White	0.08	0.09
Female	0.68	0.69
ESL	0.54	0.51
Boston site	0.82	0.78
Panel B: Treatment Variables		
GPA	3.08	3.06
Counseled by Bottom Line	0.55	0.58
Panel C: College Enrollment		
Four-year college	0.66	0.64
Two-year college	0.11	0.10
Encouraged college	0.50	0.47
Discouraged college	0.04	0.04
N	4,992	2,730

Notes: Mean values of selected variables are shown for Bottom Line applicants whose GPA is between 1.0 and 4.0. Columns 1 and 2, respectively, contain the high school classes of 2010–14 and 2010–12. Panel C shows college enrollment outcomes in the fall following high school graduation.

between 1.0 and 4.0 in order to exclude a small number of cases with extreme values far from the eligibility threshold of 2.5.

The resulting sample, shown in the first column of table 1, consists of the nearly 5,000 Bottom Line applicants from the high school classes of 2010 through 2014 who had GPAs between 1.0 and 4.0 and who were successfully merged to DESE's data. Sample characteristics are shown in panel A. Four-fifths are low-income students, as measured by receipt of subsidized lunch. Over two-thirds are black or Hispanic and a similar proportion are female. Over half speak a language at home other than English. We refer to such students as English as a second language (ESL) students. Panel B shows that the average GPA of a Bottom Line applicant is 3.08. During this period, Bottom Line accepted 55 percent of its applicants for counseling.

College enrollment outcomes in the fall immediately following high school graduation are shown in panel C.[4] Given their family backgrounds, these students have high rates of enrollment, with 66 percent enrolling in four-year colleges and another 11 percent enrolling in two-year colleges. Three-fourths of the students who enroll in a four-year college do so in one of the institutions encouraged by Bottom Line. Only 4 percent enroll in one of the colleges discouraged by the organization.

4. We define fall enrollment as having an enrollment spell that includes 1 October and, for later measures of persistence, spring enrollment as a spell that includes 1 March.

Table 2. First Stage Impact of GPA Eligibility on Counseling

	(1) Counseled by Bottom Line	(2) Only Access Program	(3) Success + Access Program	(4) Counseled, No Controls	(5) Counseled, Donut Hole	(5) Counseled, Bandwidth of 1.0
Panel A: 2010–14 Cohorts						
Eligible	0.249***	0.085***	0.163***	0.248***	0.291***	0.185***
	(0.044)	(0.019)	(0.033)	(0.043)	(0.045)	(0.046)
Control mean	0.22	0.12	0.09	0.22	0.22	0.22
N	4,992	4,992	4,992	4,992	4,546	3,780
Panel B: 2010–12 Cohorts						
Eligible	0.301***	0.134***	0.166***	0.293***	0.372***	0.266***
	(0.045)	(0.031)	(0.027)	(0.043)	(0.037)	(0.052)
Control mean	0.21	0.18	0.04	0.21	0.21	0.21
N	2,730	2,730	2,730	2,730	2,459	2,100

Notes: Robust standard errors clustered by distance from the GPA threshold are in parentheses. Coefficients in columns 1–3 come from regressions of the listed outcome on an indicator for GPA eligibility, distance from the GPA threshold, the interaction of those two, a Worcester site indicator, high school class fixed effects and the set of demographic controls shown in table A.2, using a bandwidth of 1.5 GPA points. Panel A includes the high school classes of 2010–14, and panel B includes the classes of 2010–12. The outcome in column 1 is an indicator for being counseled by Bottom Line. Columns 2 and 3 separate this treatment status into Bottom Line's two programs, Access and Success. Also listed is the mean value of each outcome for students with GPAs between 2.3 and 2.5. Columns 4–6 replicate column 1, respectively, removing the demographic controls, excluding observations less than 0.1 GPA point from the threshold, and limiting the bandwidth to 1.0 GPA point.

***$p < 0.01$.

Our initial analysis will focus on these immediate college enrollment outcomes for the five cohorts represented in our data. We later limit the sample to the first three cohorts, the high school classes of 2010 through 2012, for whom we can observe enrollment spells for at least three academic years following high school graduation. We use such observations to measure persistence in college for these earliest three cohorts. The second column of table 2 shows that those first three cohorts are quite similar to the sample as a whole.

Empirical Strategy

Whether Bottom Line is partly responsible for the high observed college enrollment rates is one key question of interest here. Evaluating the impact of college counseling is generally difficult because the quantity and quality of guidance available to a given student is correlated with numerous other determinants of enrollment and persistence, including school quality, parental involvement, and the student's own aspirations. We address this challenge by exploiting the fact that, as part of its selection process, Bottom Line uses a GPA threshold of 2.5 as one criterion for determining which students are eligible for its services. It uses this threshold to help identify students whose high school transcripts suggest they have the potential to succeed in a four-year college. We use this GPA threshold to implement a regression discontinuity design (RD) that compares the college outcomes of students just above and below that threshold. Such students should be nearly identical in terms of academic skills, as measured by GPA, as well as other characteristics, a fact we verify empirically below. They should differ only in their access to the college counseling services provided by Bottom Line.

We generate our estimates of the impact of intensive college counseling in the following way. The reduced form version of our baseline specification is a local linear regression of the form

$$College_{isc} = \beta_0 + \beta_1 Eligible_{isc} + \beta_2 GPA_{isc} + \beta_3 Eligible \times GPA_{isc} + \delta_c + X_i + \varepsilon_{isc}. \quad (1)$$

Here, *College* measures various college outcomes for student *i* in high school *s* and graduating class *c*. *Eligible* indicates whether that student is above the GPA eligibility threshold, *GPA* measures his distance from the threshold in GPA points, and *Eligible* × *GPA* is the interaction of those two variables. The two GPA variables model the relationship between GPA and college outcomes as linear, allowing that slope to vary on either side of the threshold. The coefficient on *Eligible* thus measures the difference in college outcomes between students just above and just below that threshold. Graduating class fixed effects control for year-specific differences in college outcomes that affect all students similarly. Student-level controls *X* include indicators for gender, race, low income status, ESL status, limited English proficiency status, vocational education status, and special education status, as well as an indicator for whether the student is at Bottom Line's Boston or Worcester site.

Bottom Line rejected some students above the GPA threshold and accepted others below it. As a result, the coefficients from the reduced form specification generate intent-to-treat estimates of the impact of increased eligibility for counseling on college outcomes. We are, however, interested in the impact of counseling itself. We therefore present estimates from a fuzzy RD in which we instrument the probability of treatment with GPA eligibility. Our first stage regression has the form

$$Counseled_{isc} = \beta_0 + \beta_1 Eligible_{isc} + \beta_2 GPA_{isc} + \beta_3 Eligible \times GPA_{isc} + \delta_c + X_i + \varepsilon_{isc}, \quad (2)$$

where *Counseled* indicates acceptance into the Bottom Line program.[5] We then estimate treatment impacts by running regressions of the form

$$College_{isc} = \beta_0 + \beta_1 Counseled_{isc} + \beta_2 GPA_{isc} + \beta_3 Eligible \times GPA_{isc} + \delta_c + X_i + \varepsilon_{isc}, \quad (3)$$

where students' engagement with counseling has been instrumented using the first stage equation above. The counseling coefficient thus estimates a local average treatment effect for students granted access to Bottom Line's program because of GPA eligibility.

Following Lee and Card (2008), our baseline specification for these instrumental variables estimates clusters standard errors by distance from the GPA threshold because GPA is a fairly discrete variable, with well over half of students reporting values that are multiples of 0.1. Because of the relatively small sample size, we use as a default a bandwidth of 1.5 GPA points, including GPAs of 1.0 to 4.0, which captures all but the lowest and highest GPAs. We show later that our results are robust to using a smaller

5. Nearly every student accepted into Bottom Line's program receives at least some counseling so that we do not distinguish acceptance from counseling itself.

bandwidth of 1.0, which corresponds closely to the optimal bandwidth suggested by Imbens and Kalyanaraman (2012), though precision decreases given the sample size.

Validity of our RD estimates requires that students not systematically manipulate on which side of the GPA threshold they fall. Such a problem would arise if students, in order to participate in Bottom Line, inflated their GPAs because of knowledge of the GPA admissions threshold.[6] Another potential problem would arise if knowledge of the threshold differentially affected across that threshold the number or type of student choosing to apply to Bottom Line. Although conversations with the organization suggest that the GPA threshold was not widely publicized to students, we have little actual evidence about the extent of students' awareness of it. As such, we cannot rule out the potential for bias due to manipulation or selection.

We can, however, test whether the density of students just above the threshold looks similar to the density just below the threshold, as suggested by McCrary (2008). Such tests show no evidence that GPAs just above 2.5 are over-represented relative to GPAs just below 2.5, suggesting no obvious manipulation by students. Appendix figure A.1 shows the distribution of GPAs graphically. Low GPAs are less common than high ones and multiples of 0.25 are particularly common, but there is no obvious difference in the distribution of GPAs around the eligibility threshold than around other multiples of 0.25. To rule out the possibility that students below the threshold report GPAs of 2.5 in order to qualify for counseling, we show that our results are robust to the exclusion of students with 0.1 GPA points of the bandwidth, a so-called "donut hole" regression discontinuity.

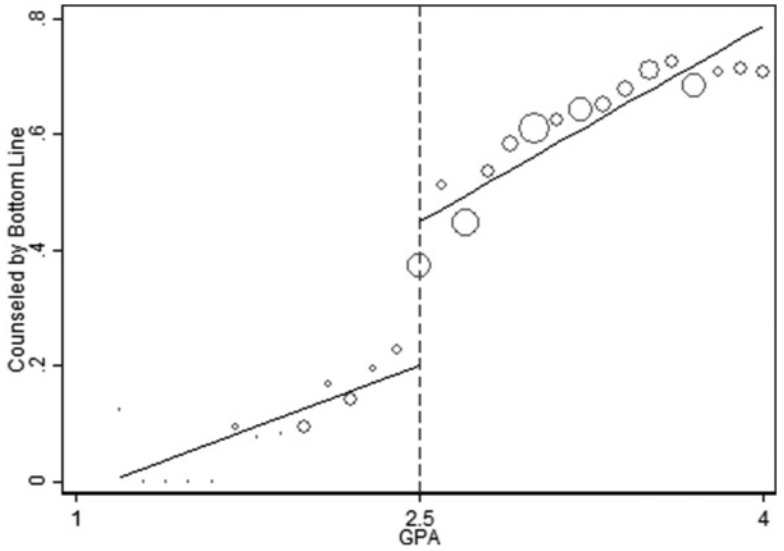
We also confirm that nearly all observable covariates are balanced across the threshold by running our reduced form specification using such covariates as outcomes. Table A.2 shows the results of these covariate balance tests, with panel A including all five cohorts and panel B including the earliest three cohorts. In each case, of the ten variables tested, nine show little clear imbalance across the threshold and the remaining one is likely due to chance. The magnitudes of any covariate imbalances differences are small enough that controlling for such covariates has nearly no effect on our estimated impacts, as we show later in our robustness checks. The balance of density and covariates at the threshold suggest that students on either side of the threshold are similar along both observable and unobservable dimensions. Our RD coefficients should therefore provide unbiased estimates of the impact of intensive counseling on college outcomes.

4. COLLEGE ENROLLMENT AND PERSISTENCE

First Stage Results

The GPA threshold provides a substantial source of exogenous variation in the probability that a given student is counseled by Bottom Line. Figure 1, which graphs the relationship between treatment probability and GPA, shows a clear discontinuity at the threshold. Table 2 presents regression-based estimates of that first stage relationship.

6. Students may have been aware that Bottom Line would eventually request transcripts in part to verify their GPAs, which might discourage students from such inflation.



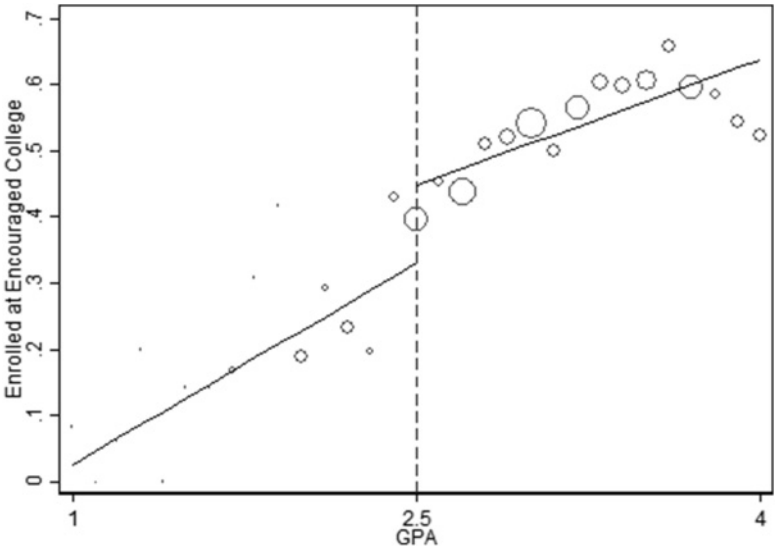
Notes: Shown here is the proportion of students accepted into the Bottom Line college advising program, by 0.1-point wide GPA bins. The size of each circle is proportional to the number of students in each bin. Also shown are the fitted lines from the baseline first stage specification described in the text. The sample includes all Bottom Line applicants from the high school classes of 2010–14.

Figure 1. First Stage Relationship between GPA and Intensive College Counseling.

For the full five cohorts, students just above the threshold are 25 percentage points more likely to receive counseling from Bottom Line than students just below the threshold. This represents roughly a doubling in treatment probability across the threshold. The *F*-statistic associated with that coefficient exceeds 30, well above the value of 10 suggested by Staiger and Stock (1997) to rule out a weak instrument. For the earliest three cohorts, GPA eligibility also provides a strong instrument, raising treatment probability by 30 percentage points.

The coefficients in column 1 will serve as our first-stage estimates for subsequent instrumental variables analyses. We show in columns 2 and 3 that the increase in treatment probability comes from an increase in both the Access program, which focuses on the application and initial enrollment process, and the Success program, which continues to counsel students after they enroll at Bottom Line's encouraged colleges. Program choice within Bottom Line is itself likely endogenous to the initial counseling process because only students who enroll at encouraged colleges are eligible for the Success program. Nonetheless, we show these estimates to highlight that the counseling treatment studied here is really the combination of two programs, one of which emphasizes initial enrollment and the other of which emphasizes persistence.

The last three columns of table 2 show that the magnitude of our first stage estimates is unchanged by exclusion of demographic controls, grows slightly in the donut hole specification excluding students immediately on the threshold, and shrinks slightly but remains a strong instrument if the bandwidth is reduced to 1.0 GPA point. Our source of exogenous variation in the probability of receiving intensive college counseling is thus relatively insensitive to empirical specification.



Notes: Shown here is the proportion of students enrolling immediately after high school graduation in one of Bottom Line's encouraged colleges, by 0.1-point wide GPA bins. The size of each circle is proportional to the number of students in each bin. Also shown are the fitted lines from the baseline reduced form specification described in the text. The sample includes all Bottom Line applicants from the high school class of 2010.

Figure 2. Enrollment at Encouraged College.

Initial Enrollment Impacts

Figure 2 shows the reduced-form relationship between GPA and enrollment in one of Bottom Line's encouraged colleges. The visually apparent discontinuity implies that Bottom Line is inducing substantial numbers of students to enroll in such colleges. We confirm this in table 3, which shows instrumental variable estimates of the impact of Bottom Line's counseling treatment on various college enrollment outcomes as measured in the fall immediately following high school graduation. Below each coefficient is the control complier mean, computed as suggested by Abadie, Angrist, and Imbens (2002). Abadie (2003) measures the expected value of the outcome variable for untreated compliers, those who would have received counseling if not for being disqualified by their GPA.

Column 1 shows that treated students are 52 percentage points more likely to enroll in one of Bottom Line's encouraged colleges, relative to an enrollment rate at these colleges of 22 percent for compliers just below the GPA threshold. Treatment also lowers the probability of enrolling in one of the discouraged colleges by 23 percentage points from a 26-percentage point baseline, suggesting that Bottom Line successfully discourages nearly all of its participants from choosing one of those colleges. Both of these estimates are statistically significant across all tested specifications, suggesting that Bottom Line is successful at directing students' enrollment behavior in the way it intends.

Counseling also lowers the probability of enrolling in a two-year college by a statistically significant 26 percentage points. Enrollment in four-year colleges rises by 20 percentage points, though this estimate is marginally statistically insignificant in only

Table 3. Impact of Counseling on Initial College Choice

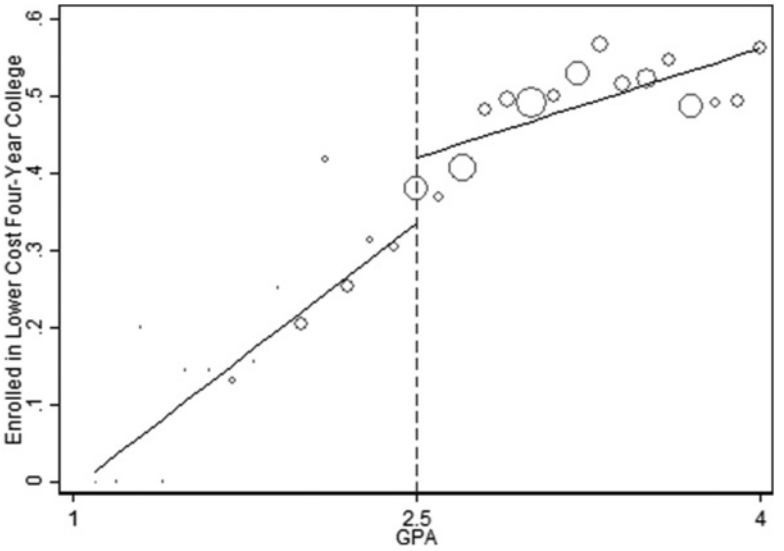
	(1) Bandwidth = 1.5, With Controls	(2) Bandwidth = 1.5, No Controls	(3) Bandwidth = 1.5, Donut Hole	(4) Bandwideth = 1.0, With Controls
Encouraged college	0.515***	0.506***	0.689***	0.463**
	(0.133)	(0.136)	(0.131)	(0.215)
CCM	0.22	0.22	0.07	0.27
Discouraged college	−0.226***	−0.224***	−0.262***	−0.315***
	(0.068)	(0.068)	(0.074)	(0.111)
CCM	0.26	0.26	0.31	0.36
Two-year college	−0.259**	−0.246*	−0.198*	−0.170
	(0.122)	(0.131)	(0.114)	(0.212)
CCM	0.32	0.31	0.30	0.24
Four-year college	0.202	0.181	0.214*	0.138
	(0.128)	(0.133)	(0.124)	(0.222)
CCM	0.55	0.56	0.51	0.63
Any college	−0.057	−0.066	0.016	−0.033
	(0.157)	(0.152)	(0.152)	(0.238)
CCM	0.87	0.87	0.80	0.88
Lower cost four-year college	0.388***	0.374***	0.360***	0.318*
	(0.112)	(0.114)	(0.105)	(0.177)
CCM	0.23	0.23	0.24	0.30
High graduation rate four-year college	0.209*	0.187	0.218*	0.216
	(0.121)	(0.127)	(0.119)	(0.200)
CCM	0.27	0.28	0.19	0.29
N	4,992	4,992	4,546	3,780

Notes: Robust standard errors clustered by distance from the GPA threshold are in parentheses. Coefficients come from regressions of the listed outcome on an indicator for Bottom Line counseling, where counseling has been instrumented with GPA eligibility as described in the text. The sample includes the high school classes of 2010–14. Outcomes are indicators for college enrollment in the fall immediately following high school graduation. Lower-cost colleges are those that the 2013 IPEDS lists as having average net price for aid-receiving students below $25,000. High-graduation rate colleges are those that the 2013 IPEDS lists as having six-year degree completion rates of at least 50 percent. Column 1 uses a bandwidth of 1.5 GPA points and includes the demographic controls listed in table A.2. Columns 2–4 replicate column 1, respectively removing the demographic controls, excluding observations less than 0.1 GPA point from the threshold, and limiting the bandwidth to 1.0 GPA point. Also listed is the control complier mean (CCM).

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

one of our four specifications. There is thus suggestive, though not conclusive, evidence that counseling causes some students to change the type of college they attend, from two-year to four-year. The two-year and four-year estimates offset each other, so that counseling appears to have little impact on the overall probability of college enrollment. Overall, we see clear evidence that Bottom Line's intensive college guidance effectively shifts students' enrollment away from two-year, or discouraged four-year, colleges, and toward four-year colleges the organization believes will be more successful at graduating those students.

One result of such shifting is that, conditional on enrolling in a four-year college, counseled students choose colleges with lower average net prices and perhaps higher graduation rates. In the penultimate row, we define a "lower cost" indicator for whether immediately after high school graduation a student enrolls in a four-year college with an average net price for aid-receiving students of under $25,000, thus avoiding some of the colleges where students are most likely to incur large amounts of debt. In the last row of table 3, we define a "high graduate rate" indicator for whether immediately after high school graduation a student enrolls in a four-year college with a six-year bachelor's



Notes: Shown here is the proportion of students enrolling in a lower cost four-year college, by 0.1-point wide GPA bins. Lower cost colleges are those whose average net price for aid-receiving students in 2012 was under $25,000. The size of each circle is proportional to the number of students in each bin. Also shown are the fitted lines from the baseline reduced form specification described in the text. The sample includes all Bottom Line applicants from the high school classes of 2010–14.

Figure 3. Enrollment in Lower Cost Four-Year Colleges.

degree completion rate of at least 50 percent. Counseling substantially and clearly increases the probability that a student enrolls in a lower cost four-year college, the reduced form graphical version of which is shown in figure 3. We also see suggestive evidence that counseling makes students more likely to choose high-graduation-rate colleges. Counseling thus appears to guide students toward colleges where they will likely incur less debt and will be more likely to graduate, as Bottom Line intends.

Persistence Impacts

Initial college enrollment is not the only outcome of interest, particularly given that many students who enroll in college do not persist and thus fail to complete their degrees. Bottom Line's Success program, which supports students throughout their time at encouraged colleges, is designed specifically to improve persistence. We can measure persistence through three years of college for the first three cohorts of students we observe, the high school classes of 2010–12.[7] To estimate persistence effects, we measure for these three cohorts the impact of counseling on four-year college enrollment in the fall of the first year, the spring of the second year, and the spring of the third year after high school graduation. We also measure the total number of fall and spring semesters in which a student has been enrolled in a four-year college by the spring of his third

7. Although we can observe the earliest two cohorts through four years of college, three cohorts is the minimum we need in order to generate estimates with sufficient precision to be of interest.

Table 4. Impact of Counseling on Persistence in Four-Year Colleges

	(1) Bandwidth = 1.5, With Controls	(2) Bandwidth = 1.5, No Controls	(3) Bandwidth = 1.5, Donut Hole	(4) Bandwidth = 1.0, With Controls
Enrolled in four-year college, fall year 1	0.126	0.093	0.136	0.083
	(0.138)	(0.150)	(0.119)	(0.193)
CCM	0.56	0.58	0.53	0.63
Enrolled in four-year college as of spring year 2	0.256**	0.223*	0.206**	0.266*
	(0.103)	(0.114)	(0.089)	(0.147)
CCM	0.33	0.34	0.33	0.36
Total semesters enrolled through spring year 2	0.771*	0.646	0.705*	0.656
	(0.453)	(0.503)	(0.385)	(0.657)
CCM	1.72	1.78	1.68	1.94
Enrolled in all semesters through spring year 2	0.274**	0.239**	0.231**	0.290*
	(0.110)	(0.114)	(0.093)	(0.163)
CCM	0.25	0.26	0.26	0.26
Enrolled in four-year college as of spring year 3	0.186	0.163	0.194	0.197
	(0.142)	(0.137)	(0.140)	(0.188)
CCM	0.29	0.29	0.26	0.33
Total semesters enrolled through spring year 3	1.165*	0.990	1.061*	1.083
	(0.651)	(0.699)	(0.582)	(0.946)
CCM	2.32	2.39	2.28	2.60
Enrolled in all semesters through spring year 3	0.181	0.157	0.185*	0.231
	(0.127)	(0.128)	(0.106)	(0.183)
CCM	0.24	0.24	0.21	0.26
N	2,730	2,730	2,459	2,100

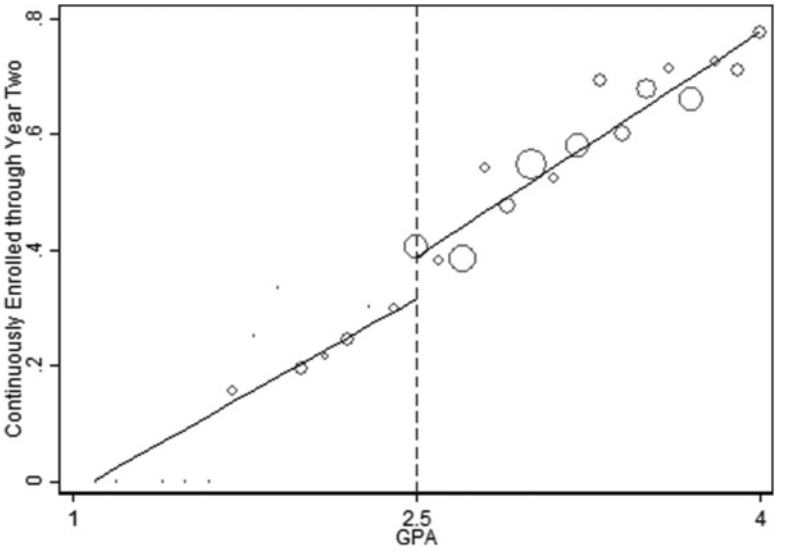
Notes: Robust standard errors clustered by distance from the GPA threshold are in parentheses. Coefficients come from regressions of the listed outcome on an indicator for Bottom Line counseling, where counseling has been instrumented with GPA eligibility as described in the text. The sample includes the high school classes of 2010–12. The first row's outcome is an indicator for four-year college enrollment in the fall immediately after high school graduation. The second row's outcome is an indicator for four-year college enrollment in the spring two years after high school graduation. The third row measures the total number of semesters enrolled in four-year colleges by that second spring, and the fourth row uses an indicator for four semesters of such enrollment by that second spring. The remaining three rows repeat those outcomes but for the spring of the third year following high school graduation. Column 1 uses a bandwidth of 1.5 GPA points and includes the demographic controls listed in table A.2. Columns 2–4 replicate column 1, respectively removing the demographic controls, excluding observations less than 0.1 GPA point from the threshold, and limiting the bandwidth to 1.0 GPA point. Also listed is the control complier mean (CCM).

*$p < 0.10$; **$p < 0.05$.

year, as well as the probability that he has enrolled continuously in all such semesters to date.[8]

Table 4 shows the result of such analysis. The point estimates in the first row suggest that, for these earliest three cohorts, counseling increases four-year college enrollment rates in the fall immediately following high school graduation by a statistically insignificant 10 percentage points or so. By the spring of their second year, counseled students are a statistically significant 26 percentage points more likely to be enrolled in a four-year college. They have enrolled in about 0.7 more semesters of four-year college by that time and are 27 percentage points more likely to have been enrolled for all four semesters to date. The latter result represents roughly a doubling of the baseline probability of such continuous enrollment. A graphical version of that result is shown in figure 4.

8. By construction, this variable can range from zero (no four-year college enrollment at any time) to six (four-year college enrollment in all semesters observable by the end of the third year).



Notes: Shown here is the proportion of students continuously enrolled in four-year colleges for the two years following high school graduation, by 0.1-point wide GPA bins. The size of each circle is proportional to the number of students in each bin. Also shown are the fitted lines from the baseline reduced form specification described in the text. The sample includes all Bottom Line applicants from the high school classes of 2010–12.

Figure 4. Persistence at Four-Year Colleges.

Nearly all of these persistence results by the spring of the second year after high school graduation are marginally or statistically significant. By the spring of students' third year, we still observe positive impacts on these various persistence measures, although only a few are marginally statistically significant. These results provide clear evidence that counseling improves overall persistence in four-year colleges through the end of students' second year, as well as suggestive evidence of improvement through the third year.

5. DISCUSSION AND CONCLUSION

Improving college access and success for economically disadvantaged students has emerged as a top policy priority at the federal level. Much attention has been devoted to low-cost, easily scaled strategies to improve college entry and success for lower-income students. These informational and behavioral strategies have generated positive impacts for high-achieving students and for students who have already completed several key stages in the application process. It is an open question, however, whether these low-touch interventions would be similarly effective for students lower in the academic distribution or for students who are not as far along in the college process. In the absence of this evidence, many communities still provide intensive college-advising to help high school juniors and seniors through the college and financial aid application process. Bottom Line is one such model, with a particular focus on guiding students to enroll at colleges and universities where the program believes students are well-positioned to graduate without incurring substantial debt.

Our results show clear evidence that such intensive college counseling influences students' college choices, with counseled students substantially more likely to enroll in colleges encouraged by the program. Counseling thus shifts students toward four-year colleges that are substantially less costly than ones they otherwise would have chosen. By helping students enroll and persist at institutions where they are equally likely to succeed but at substantially lower average cost, Bottom Line may reduce the financial burden students incur in pursuing a college degree. Given substantial policy attention to rising loan default rates and the negative impacts that loan repayments can have on asset accumulation and other outcomes, this is an encouraging finding. It also suggests that other college access programs may want to focus not only on increasing enrollment rates but also on shifting students toward colleges with better characteristics, such as cost and graduation rates. It may be easier to change the college choices of students on the intensive margin (choosing which college to attend) than the extensive margin (choosing whether to attend).

There is also suggestive, though not conclusive, evidence that counseling shifts some students from the two-year sector and into the four-year sector. Importantly, we also see suggestive evidence of increased persistence in four-year colleges after three years. This suggests that intensive counseling alters not only initial college enrollment but also subsequent longer-run outcomes critical to evaluating the efficacy of such programs.

There is a growing body of evidence that suggests the choice of where to enroll for lower-income or first-generation students can have important consequences for their longer-term success. Recent research demonstrates that students who are just above an admissions threshold for a public four-year university have substantially higher bachelor's degree completion rates than students just below the threshold who have access to community colleges instead (Goodman, Hurwitz, and Smith 2017). There has been a dramatic increase in loan default rates among borrowers at for-profit institutions and community colleges, which enroll a substantial share of the lower-income and first-generation student populations (Dynarski 2014). Employers appear to assign less value to degrees from for-profit institutions than they do degrees from less-selective public institutions, and labor market returns to a for-profit degree are also lower than for degrees from other institutions (Cellini and Turner 2016; Deming et al. 2016). Thus, Bottom Line's impacts on low-income students' college choices have the potential to generate lasting positive impacts further down the road.

Moreover, Bottom Line's ability to encourage, through advising, students to attend institutions with comparable quality but lower net costs can also inform ongoing state and federal efforts, such as the recently updated College Scorecard, to promote more informed consumer choice about higher education. One potential conclusion is that the Department of Education should invest in resources to proactively reach out to students and families about the information contained in the Scorecard, especially with newly available information about indebtedness and earnings, to help them make informed choices about where they apply and attend.

One question that our research cannot definitively address is the channel through which intensive college counseling affects college persistence. Counseling during high school affects college choice and affordability, which may be sufficient to explain the observed persistence results. Many of the treated students continue, however, to receive

counseling while enrolled at college, a key feature of Bottom Line's model. We cannot identify whether increased college affordability or continuing support while on campus, or some combination thereof, explains increased persistence.

An open question is whether Bottom Line's impact on where students enroll and whether they persist are sufficient to justify the program's cost of approximately $5,000 per student served, given that the Access program costs about $1,400 per student and the Success program costs about $1,000 for each year a student is in college. Our estimates suggest increased four-year college enrollment and persistence rates on the order of 20 percentage points, which in turn suggests a cost of roughly $25,000 per additional college enrollee or persister. Cohodes and Goodman (2014) estimate that, in Massachusetts, the net present value of a college degree relative to some college without a degree is roughly $1,000,000. If Bottom Line's persistence impacts translate into completion impacts, then this treatment raises students' lifetime earnings by roughly $200,000, far outweighing the costs of the intervention.

Nonetheless, it is important to ask whether the financial resources currently allocated to programs like Bottom Line could be more effectively allocated to other policy strategies for improving college access and success. Dynarski, Hyman, and Schanzenbach (2013) note that class size reductions in the Tennessee STAR experiment cost $400,000 per additional college enrollee, while Upward Bound's bundle of treatments costs over $90,000 per additional enrollee. Bottom Line's costs look quite favorable relative to these interventions. Conversely, the Free Application for Federal Student Aid (FAFSA) completion assistance program studied in Bettinger et al. (2012) costs only $1,100 per additional college enrollee, and the peer mentoring programs studied in Carrell and Sacerdote (2013) cost only $2,400 per additional enrollee. The intensive counseling provided by Bottom Line falls somewhere in the middle of the cost distribution of this spectrum of interventions.

It is also important to ask how scalable programs like Bottom Line are to other communities, both because of the costs per student served and because of the leadership and expertise required to advise students as comprehensively as Bottom Line does. One potential interesting area for further inquiry is whether intensive advising programs like Bottom Line can provide similar one-on-one guidance to students remotely, via interactive technologies like video chat, screen sharing, and document collaboration. This type of remote advising, if successful, could allow for economies of scale to lower the per student costs. The CollegePoint initiative, supported by Bloomberg Philanthropies, is currently investigating the efficacy of this remote advising approach.

As a result of these considerations, we have begun collaborating with Bottom Line on the design of a long-term randomized controlled trial to more thoroughly evaluate the program's impact on students' college trajectories. Starting with the graduating class of 2015, we are implementing a multi-cohort experiment across Bottom Line's Massachusetts and New York sites. This experiment will provide sufficient power to more precisely detect overall enrollment and persistence patterns, and the randomized design will allow us to investigate average treatment effects across the population of students who are eligible for the program. In addition, we are conducting surveys with students both while they are still in high school and once they have matriculated in college, in order to better investigate both the mechanisms through which Bottom Line is affecting students' decisions and college outcomes, and to capture a more holistic

set of measures for how Bottom Line is impacting students' college choices and postsecondary experiences. We will follow students for six to eight years following high school graduation in order to investigate the program's effect on degree completion. The results of this experiment will better explore whether intensive advising programs like Bottom Line, which clearly impact the type of institution at which students enroll, justify the greater upfront resource investment.

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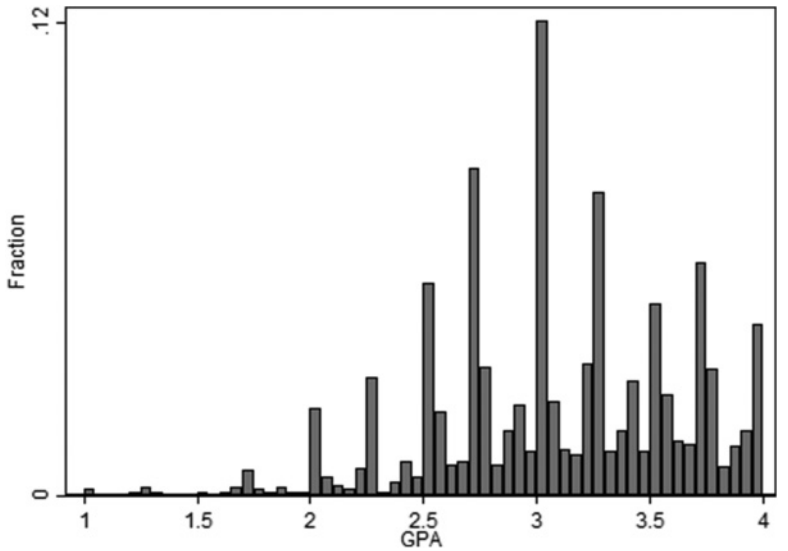
APPENDIX A: ADDITIONAL DATA



Notes: Shown here is the distribution of GPAs among Bottom Line applicants from the high school classes of 2010–14.

Figure A.1. GPA Distribution.

Table A.1. Characteristics of Bottom Line's Encouraged and Discouraged Colleges

Institution	Sector	Main Degree	Undergraduate Enrollment	Net Cost	In-State Tuition	Six-Year Graduation Rate	Percent Receiving Pell Grant
Panel A: Encouraged Colleges							
Bentley University	Private nonprofit	BA	4,172	29,886	41,110	0.87	0.16
Boston College	Private nonprofit	BA	9,465	33,070	45,622	0.91	0.14
Boston University	Private nonprofit	BA	16,460	34,603	44,880	0.84	0.15
Bridgewater State University	Public	BA	9,489	17,477	8,053	0.58	0.24
Clark University	Private nonprofit	BA	2,312	23,415	39,550	0.81	0.21
Fitchburg State University	Public	BA	4,148	12,849	8,985	0.50	0.34
Framingham State University	Public	BA	4,255	17,552	8,080	0.51	0.28
College of the Holy Cross	Private nonprofit	BA	2,878	32,118	44,272	0.91	0.16
University of Massachusetts-Lowell	Public	BA	11,830	16,351	12,097	0.54	0.30
University of Massachusetts-Amherst	Public	BA	21,672	19,087	13,443	0.73	0.25
University of Massachusetts-Boston	Public	BA	11,786	11,741	11,966	0.44	0.38
MCPHS University	Private nonprofit	BA	3,808	34,345	28,470	0.71	0.30
Massachusetts College of Liberal Arts	Public	BA	1,483	14,837	8,525	0.57	0.45
Northeastern University	Private nonprofit	BA	13,204	31,503	41,686	0.83	0.14
Quinsigamond Community College	Public	AA	7,647	6,510	5,094	.	0.45
Salem State University	Public	BA	7,134	15,420	8,130	0.46	0.33
University of Massachusetts-Dartmouth	Public	BA	7,202	17,092	11,681	0.49	0.38
Suffolk University	Private nonprofit	BA	5,535	27,507	31,716	0.55	0.29
Wentworth Institute of Technology	Private nonprofit	BA	3,975	31,201	29,200	0.63	0.28
Worcester Polytechnic Institute	Private nonprofit	BA	4,012	35,483	42,778	0.81	0.15
Worcester State University	Public	BA	5,033	14,402	8,157	0.49	0.27
Unweighted average			7,500	22,688	23,500	0.66	0.27
Panel B: Discouraged Colleges							
Bay State College	Private for-profit	AA	1,196	25,440	19,748	0.27	0.51
Becker College	Private nonprofit	BA	1,871	28,697	31,500	0.31	0.39
Curry College	Private nonprofit	BA	2,794	30,561	34,715	0.45	0.26
Fisher College	Private nonprofit	AA	1,733	30,797	27,575	0.39	0.58
Lasell College	Private nonprofit	BA	1,667	25,316	30,000	0.53	0.32
Mount Ida College	Private nonprofit	BA	1,261	27,772	29,377	0.40	0.39
Newbury College	Private nonprofit	BA	961	24,111	28,950	0.31	0.50
Nichols College	Private nonprofit	BA	1,260	26,673	32,370	0.47	0.35
Regis College	Private nonprofit	BA	1,188	37,829	34,380	0.49	0.36
Unweighted average			1,548	28,577	29,846	0.40	0.41

Notes: Panel A lists the colleges to which Bottom Line encourages students to apply. Panel B lists those colleges to which Bottom Line discourages students from applying. College characteristics are taken from the 2013 version of the IPEDS. Beneath each panel is the unweighted average of each characteristic across the given set of colleges. Averages weighted by undergraduate enrollment are very similar.

Table A.2. Covariate Balance Test

	(1) Female	(2) Low income	(3) Hispanic	(4) Asian	(5) White	(6) Other	(7) ESL	(8) LEP	(9) Special education	(10) Vocational Education
Panel A: 2010–14 Cohorts										
Eligible (BW = 1.5)	0.027	−0.010	−0.074**	0.031	−0.017	−0.016	0.035	0.026	−0.005	0.030
	(0.043)	(0.032)	(0.033)	(0.021)	(0.019)	(0.014)	(0.037)	(0.021)	(0.023)	(0.020)
N					4,992					
Eligible (BW = 1.0)	0.025	−0.015	−0.047	0.014	−0.030	−0.021	0.023	0.005	−0.004	0.033
	(0.052)	(0.040)	(0.041)	(0.023)	(0.020)	(0.018)	(0.049)	(0.025)	(0.026)	(0.023)
N					3,780					
Control mean	0.69	0.75	0.37	0.05	0.08	0.05	0.39	0.07	0.07	0.17
Panel B: 2010–12 Cohorts										
Eligible (BW = 1.5)	0.016	−0.038	−0.077	0.025	0.013	−0.022	−0.031	0.033	−0.014	0.079**
	(0.050)	(0.039)	(0.047)	(0.023)	(0.030)	(0.026)	(0.039)	(0.025)	(0.021)	(0.035)
N					2,730					
Eligible (BW = 1.0)	0.054	−0.056	−0.075	0.014	0.005	−0.028	−0.051	0.018	−0.001	0.093**
	(0.054)	(0.048)	(0.057)	(0.028)	(0.029)	(0.031)	(0.047)	(0.028)	(0.021)	(0.041)
N					2,100					
Control mean	0.67	0.72	0.40	0.02	0.09	0.12	0.40	0.05	0.11	0.16

Notes: Robust standard errors clustered by distance from the GPA threshold are in parentheses. Coefficients come from regressions of the listed covariate on an indicator for GPA eligibility, distance from the GPA threshold, the interaction of those two, and high school class fixed effects, using a bandwidth (BW) of 1.5 and 1.0 GPA points. Panel A includes the high school classes of 2010–14, and panel B includes the classes of 2010–12. Covariates tested are all indicators, including in columns 7–10 English as a second language, limited English proficiency, special education, and vocational education status. Also listed is the mean value of each covariate for students with GPAs between 2.3 and 2.5.

** $p < 0.05$.